TV VHF mixer/oscillator UHF preamplifier — TDA5030A

GENERAL DESCRIPTION

The TDA5030A provides VHF local oscillator, VHF mixer and UHF IF preamplifier functions for VHF/UHF television receivers. It includes a buffered output from the VHF local oscillator, a VHF/UHF switching circuit and an IF amplifier stage for an external SAW filter.

Features

- Balanced VHF mixer
- Voltage-controlled VHF local oscillator
- IF amplifier for SAW filter
- UHF IF preamplifier
- Local oscillator buffer output for external prescaler
- Voltage stabilizer
- UHF/VHF switching circuit
- Electrostatic discharge protection diodes at pins 10, 11, 12 and 13

QUICK REFERENCE DATA

parameter	conditions	symbol	min.	typ.	max.	unit
Supply voltage	pin 15	V_P	10	–	13,2	V
Supply current		I_P	–	42	–	mA
VHF mixer frequency range		f	50	–	470	MHz
Conversion gain			–	24,5	–	dB
Conversion noise	300 MHz		–	10	–	dB
Input signal for 1% cross modulation			–	99	–	dBμV
Storage temperature range		T_{stg}	–55	–	+ 125	°C
Operating ambient temperature range		T_{amb}	–25	–	+ 85	°C

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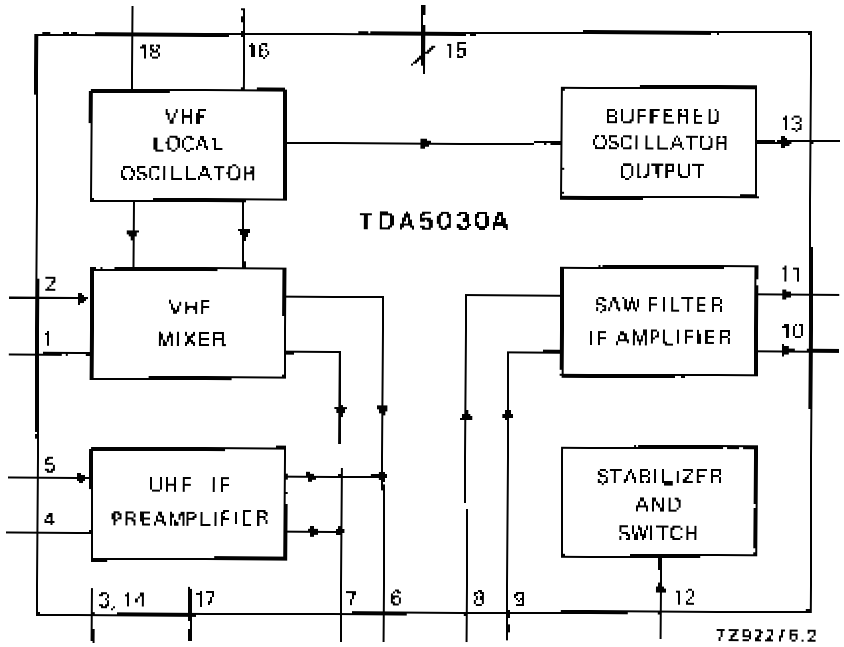


Fig. 1 Block diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

parameter	conditions	symbol	min.	max.	unit
Supply voltage	pin 15	$V_P = V_{15\text{-}3}$	–	14	V
Input voltage	pins 1, 2, 4 and 5	V_i	0	5	V
VHF switching voltage	pin 12	V_{12}	0	V_{15}+ 0,3	V
Output current	pins 10, 11 or 13	$-I_{10, 11, 13}$	–	10	mA
Short-circuit time on outputs	pins 10 and 11	t_{ss}	–	10	s
Storage temperature range		T_{stg}	–55	+ 125	°C
Operating ambient temperature range		T_{amb}	–25	+ 85	°C
Junction temperature range		T_j	–	+ 125	°C

THERMAL RESISTANCE

From junction to ambient $R_{th\ j\text{-}a}$ 55 K/W

CHARACTERISTICS

Measured in circuit of Fig. 2, $V_P = V_{15\text{-}3} = 12$ V, $T_{amb} = 25$ °C, unless otherwise specified

parameter	conditions	symbol	min.	typ.	max.	unit
Supply						
Supply voltage	pin 15	$V_{15\text{-}3}$	10	–	13,2	V
Supply current		I_{15}	–	42	55	mA
Switch voltage level for VHF	pin 12	V_{12}	0	–	2,5	V
Switch voltage level for UHF	pin 12	V_{12}	9,5	–	V_{15}+ 0,3	V
Switch current	UHF selected	I_{12}	–	–	0,7	mA
VHF mixer (including IF amplifier)						
Frequency range		f	50	–	470	MHz
Noise factor	pin 2					
	f = 50 MHz	F	–	7,5	9	dB
	f = 225 MHz	F	–	9	10	dB
	f = 300 MHz	F	–	10	12	dB
	f = 470 MHz	F	–	11	13	dB
Optimum source conductance	pin 2					
	f = 50 MHz	G	–	0,5	–	mS
	f = 225 MHz	G	–	1,1	–	mS
	f = 300 MHz	G	–	1,2	–	mS
Input conductance	pin 2					
	f = 50 MHz	G_i	–	0,23	–	mS
	f = 225 MHz	G_i	–	0,5	–	mS
	f = 300 MHz	G_i	–	0,67	–	mS
Input capacitance	pin 2					
	f = 50 MHz	C_i	–	2,5	–	pF
Input voltage for 1% cross-modulation (in channel)		$V_{2\text{-}3}$	97	99	–	dBμV
Input voltage for 10 kHz pulling (in channel)	f < 300 MHz	$V_{2\text{-}14}$	100	–	–	dBμV
Voltage gain		A_v	22,5	24,5	26,5	dB

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CHARACTERISTICS (continued)

parameter	conditions	symbol	min.	typ.	max.	unit
UHF preamplifier (including IF amplifier)						
Input conductance	pin 5	G_i	–	0,3	–	mS
Input capacitance	pin 5	C_i	–	3,0	–	pF
Noise factor	pin 5	F	–	5	6	dB
Optimum source conductance	pin 5	G	–	3,3	–	mS
Input voltage for 1% cross-modulation (in channel)		$V_{5\text{-}14}$	88	90	–	dBμV
Voltage gain		A_v	31,5	33,5	35,5	dB
VHF mixer						
Conversion transadmittance	pins 2 to 6,7	$Yc_{2\text{-}6,7}$	–	5,7	–	mS
Output impedance	pins 6 and 7	Z_o	–	1,6	–	kΩ
VHF oscillator						
Frequency range		f	70	–	520	MHz
Frequency shift	ΔV_P = 10%; f = 70–330 MHz	Δf	–	–	200	kHz
Frequency drift	ΔT = 15 K; f = 70–330 MHz	Δf	–	–	250	kHz
Frequency drift	between 5 s and 15 min after switch-on	Δf	–	–	200	kHz
SAW filter IF amplifier						
Input impedance	$Z_{10,11}$ = 2 kΩ; f = 36 MHz	$Z_{8,9}$	–	300+ j100	–	Ω
Transimpedance		$Z_{8,9\text{-}10,11}$	–	2,2	–	kΩ
Output reflection coefficient:	f = 36 MHz					
modulus			0,45	0,37	0,41	
phase			−63	−112	−134	deg

parameter	conditions	symbol	min.	typ.	max.	unit
VHF local oscillator output buffer						
Output voltage	pin 13 R_L = 75 Ω f < 100 MHz	V_{13}	14	20	–	mV
	f > 100 MHz	V_{13}	10	20	–	mV
Output impedance	f = 100 MHz	Z_{13}	–	90	–	Ω
RF signal on local oscillator output	R_L = 75 Ω					
	V_i = 1 V; f ≤ 225 MHz	RF/(RF+LO)	–	–	10	dB
	V_i = 0,3 V; f = 225–300 MHz	RF/(RF+LO)	–	–	10	dB
IF signal on local oscillator output	UHF selected; R_L = 75 Ω; V_i = 350 mV	IF/(IF+LO)	–	–	3	mV
Local oscillator harmonics w.r.t. local oscillator output signal	R_L = 75 Ω		–	–	–14	dB

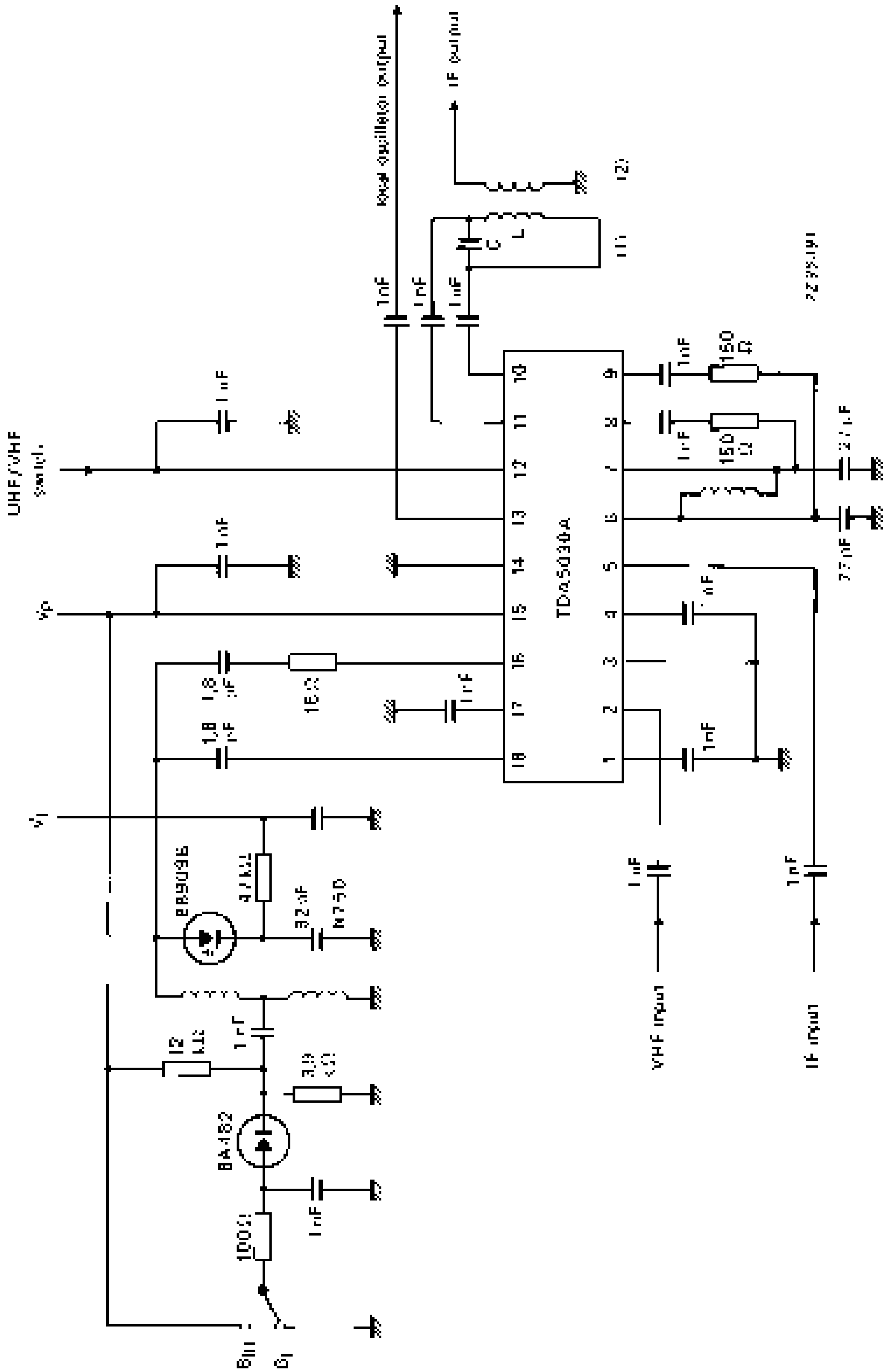


Fig. 2 Test circuit.

(1) C = 18 pF, L = 2,2 µH, f_{CL} = 36,5 MHz.

(2) Turns ratio = 7 : 1, load = 50 Ω.